

# Centripetal Forces Of Urbanization In Barddhaman Municipality, West Bengal

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## Abstract

*Barddhaman is one of the oldest town of Erstwhile Barddhaman district in West Bengal. Barddhaman (Burdwan) became an urban centre in 1856 and a municipal town in 1865. In 1961 Burdwan became a Class-I town and after fifty years Barddhaman has now 314265 population (2011) over 26.3 sq km area. Initially Barddhaman town emerged as a market centre to her surrounding rural area as patronaged by Burdwan Rajas. But later urbanization of this town was geared by mainly service sector. The centripetal forces of urbanization of this town are educational, medical, transport and marketing facilities along with agro-based industry like rice mills since its inception. This assemblage of these socio-economic amenities has invited immigrants to this town from surrounding areas. Growing population density has enforced vertical expansion of the town and urban hazards as well. So a planned development and geographical expansion of the town is the hour of need.*

*Keywords: Barddhaman, urbanization, service sector.*

## 1. Introduction

In the history of Indian urbanization historical places, state capitals, regional capitals and industrial centres have often been given the importance to become an urban centre. Since 1991 as a result of globalization and adoption of neo-Liberalization Policy in India metropolitan cities become the best area for investment. So a metro-biased urban development is the real scenario of Indian urbanization (Bhattacharya, 2006; Rao, 2013). Infrastructural development in other regional towns is neglected. Siphoning of resource to metros keeps large part of eastern and northern India rural. In Eleventh Plan it has been admitted that degree of urbanization in India is one of the lowest in the world. During 2001-2011 a decelerating

urban growth is found in Indian metro cities. So the creation of new growth centres in the form of small and medium towns is a major challenge of Indian urbanization (Kundu, 2011). Focus should also be given to the regional Class-I towns which can provide urban benefits to their surrounding rural and small urban centres. This will minimise the burden of metro cities. The existing resource and potentiality of the class- I towns should be capitalised to increase their urban density.

In West Bengal the capital city Kolkata has the agglomeration of all administrative and socio-economic facilities and therefore there is poor urban development in her surrounding area and overpopulation is causing deterioration of urban infrastructure and basic urban amenities in Kolkata.

Bardhaman, a Class-I town with her unique character of rich agricultural hinterland as well as historical and administrative importance of Rajas (Jamindars) can be a good example of searching for urban potentiality as the town keeps up her identity even being located between two million-cities, Kolkata and Asansol in the east and west.

## 2. Objective

Objective of this paper is to find out

- i) The landuse pattern of the study area, Bardhaman town.
- ii) The pull factors that attract immigrants to the town.
- i) The spatial distribution of population in the town.
- ii) The Present trend of expansion of the town.

## 3. Data Sources And Methodology

Data is largely based on secondary data. Here ward wise population data has been collected from Census (2001, 2011) and Burdwan Municipality office. To prepare NDVI and landuse land cover map Resourcesat-2, LISS-IV sensor, November, 2015 data has been used. Primary data for educational, medical and transport facilities have been collected from field survey and concerned institutes or offices. Ward wise location of multi-storied buildings is entirely based on primary field survey. A door to door survey has also been conducted on people's perception for settling in this town.

The landuse map has been prepared using LISS-IV data (2015) and ArcGIS software. The vector map of the study area has been converted into AOI format and

with this the image has been subset. The data has been clubbed into six categories (water body, settlement and concrete area, dense vegetation, scattered vegetation, dry fallow and wet fallow) following unsupervised image classification technique. Normalised Difference Vegetation Index (NDVI) has been calculated and represented by Erdas and Arc GIS (10.2) softwares. It shows the proportional share of various physical and cultural landuse categories. To get the spatial pattern of population distribution ward wise population density map (2011) has been prepared. Factors behind immigration to the town have been analysed from field observations.

## 4. Discussion

### 4.1 Location

Bardhaman Municipality is one of the six old towns and the district head quarter of former Bardhaman district and it is the only Class-I town of East Bardhaman district. Geographically it's located at 23°12'N to 23°14'56" N latitude and 87°48'32"E to 87°52'52"E longitude. Burdwan became an urban centre as early as in 1856 and it owes its historical importance to being the headquarter of the Maharajas of Burdwan. The Municipality was set up in 1865 with a population of 39,818 over 12.8 sq. km. area. ([burdwanmunicipality.gov.in](http://burdwanmunicipality.gov.in)) and Burdwan became class-I town in 1961. This town emerged as an agricultural market of surrounding fertile rural tract and agro-based industry like rice mills. Over the years service sector becomes more important in the economic scenario of this town owing to better educational, medical, transport and marketing facilities.

#### 4.2 Landuse and Land Cover of the Town

Physiographically the town is located on the bank of river Damodar belonging to the Lower Gangetic Plain of India. Barddhaman experiences a relief variation of 25m- 35m. The town is served by river Banka in the central part flowing from west to east. Being located in the Damodar floodplain of Lower Gangetic Plain Barddhaman is rich in alluvial soil and coarse sand aquifer below the surface due to recurring flood of the Damodar (Laha, 2012). The town possesses a reserve forest of mixed sal and a sanctuary, which covers 0.14 km<sup>2</sup> area. (DFO, Barddhaman, 2005).

Table: 1. Major Landuse Categories of Barddhaman Municipality

Landuse and land cover Categories	Area in %
Water body	8.478
Dense vegetation	28.659
Scattered vegetation	14.139
Settlement and concrete area	33.757
Dry fallow land	9.015
Wet fallow land	5.949
Total	100

Source: Calculated from Resourcesat 2 (LISS- IV), November, 2015 data.

Much of natural Sal forest of the town has been destroyed due to expanding settlement area in the south-eastern part. The NDVI value is negative (-0.08) in the central and northern part due to high concentration of built-up area, large lakes and commercial centres there. Vegetation concentration is higher towards the west and south-west and

also in patches of eastern and south-eastern parts where NDVI value is positive with highest value, 0.56. The NDVI value is less in northern and southern parts (Fig. 1 see page 49).

The landuse and landcover map of Barddhaman municipality in 2015 (Table. 1, Fig. 2 see page 49) shows that about 28.6% area of the municipality is under dense vegetation and 14.1% area under scattered vegetation. Dense vegetation is concentrated in the west (wards 23 and 24) and north- west (wards 27), than the eastern and central part of the town. About 9% area lies under wet fallow and 5.9% under dry fallow land cover. About 33.8% area is covered by concrete and settlement area. The town is dotted with number of ponds. There are >100 ponds and four large tanks or *sayars* as excavated by Barddhaman Rajas and about 8.5% area is occupied by water bodies in the town.

#### 4.3 Spatial Variation of Population Distribution and Population Density in Barddhaman Municipality

Barddhaman municipality, an age old town still contains 42.7% vegetation cover and 33.8% concrete or built-up area. There is a total population of 314265 (2011) with 10% decadal growth from 2001 (285602) and an uneven spatial distribution. The larger wards (1, 3, 4, 7, 11, 12, 13, 15, 17, 24, 26) have a total population ranging from 11000 to 16000 experiencing a population growth rate of 10%- 25% in last decade. Only exceptions among them are wards 3 and 4 experiencing negative growth rate and ward 6 having <10% growth rate. Maximum population growth occurs in ward 23 (32%). Fifteen small size wards located at the central part

of the town have 4000-7000 population and a low population growth rate (<10%) over the decade. Among them negative growth rate is observed in wards 29 (-8.6%) and 32 (-10%) which are dominated by commercial built-up areas, hospital, nursing homes, schools, colleges etc. The rest of the wards have moderate population size (7000-11000)

and a moderate population growth of 5%-10% (Table. 2).

Population density of Barddhaman town has increased by 2.5 times over fifty years from 4776 persons/sq.km in 1961 to 11949 persons/sq.km in 2011. However a spatial variation of ward-wise population density of the town is also noticeable (5000

Table. 2. Ward-wise Population Distribution, Growth and Population Density of Barddhaman Municipality (2001-2011)

Ward No.	Population (2001)	Population Density (2001)	Population (2011)	Population Density (2011)	Population Growth Rate (2001-2011)
1	12031	23781	14449	28562	20.1
2	8472	15274	9554	17226	12.77
3	15447	48159	14783	46089	-4.3
4	10656	19355	10105	18355	-5.17
5	5987	19570	7042	23019	17.62
6	14462	11745	15405	12511	6.52
7	10153	18932	11899	22187	17.19
8	6121	12658	6843	14151	11.8
9	6774	12487	6843	12614	1.02
10	7810	13713	8183	14368	4.78
11	9486	13799	11570	16831	21.97
12	13500	10436	16070	12422	19.04
13	10395	10049	11240	10866	8.13
14	7040	15375	7541	16469	7.12
15	9645	15611	10723	17355	11.18
16	9963	5515	11563	6401	16.06
17	9363	9821	10191	10690	8.84
18	6293	14638	6698	15580	6.44
19	6288	22983	7036	25717	11.9
20	4751	23436	5185	25577	9.13
21	6587	15420	6989	16361	6.1
22	8090	7097	8863	7775	9.56
23	6355	7157	8398	9457	32.15

24	10769	6020	13311	7441	23.6
25	8236	10272	9743	12151	18.3
26	10728	3959	13309	4911	24.06
27	7914	11900	9361	14076	18.3
28	4234	4782	4442	5017	4.91
29	6640	18657	6064	17038	-8.67
30	4647	13723	4511	13321	-2.93
31	4004	14536	4412	16018	10.19
32	4923	30394	4431	27357	-9.99
33	6243	29850	6366	30438	1.97
34	5159	19667	5168	19701	0.17
35	6435	18347	6702	19108	4.15

Source: District Census Handbooks, Barddhaman, 2001, 2011. Census of India and Municipality of Burdwan, 2016.

to 46000 persons/ sq.km in 2011). Trade and commerce, administrative works and medical facilities are concentrated in the central part of the town and therefore very high population density (>24000 persons/sq.km.) is found in the wards 1, 3, 19, 20, 32 and 33. Highest population density is found at ward 3 (46089 persons/sq.km). Population density is also high (14000-24000 persons/sq.km) and above the municipality average in sixteen small size wards at central and northern part of the town. Relatively low population density (<9000 persons/sq.km) is found at five large size wards (16, 22, 24, 26, 28) located at southern, western and eastern boundary of the municipality. In between the low and high population density zones there are eight wards (6, 9, 12, 13, 17, 23, 25, 30) with moderate population density (9000-14000 persons/sq.km). These wards of low and moderate population density are either largely occupied by rice mills (wards 17, 22, 23), university campus (wards 26)

or by dense natural vegetation (wards 23, 24, 26) with a distant location from the nodal points (Table. 2, Fig. 3 See page 48). However much of the vegetated area has been cleared for extending settlement area to the south-eastern part in last twenty five years, and still open areas are there to the western part of the town.

#### ***4.4 Centripetal Forces of Urbanization in the Municipality***

Initially the main pulling force of urbanization in Barddhaman was her administrative facilities and presence of number of rice mills. Still there are 24 out of 27 running rice mills within Barddhaman municipality and many other rice mills are located adjacent to the municipality boundary. The fertile agricultural tract drained by the Ganges, the Damodar and the Ajay in East Barddhaman favoured the growth of rice mills here. Rice mills have a wide hinterland of Barddhaman, Bankura, Hooghly and Birbhum districts for

raw material and also have wide market in the state. However over the time expansion of social amenities like educational and medical facilities along with growing transport facility and emerging consumer market have become more important factors of urbanization.

#### **4.4.1 Educational Facilities**

Bardhaman town stands second in the state after Kolkata considering the existing educational facilities. In this town there is a university that serves the districts of Bardhaman, Birbhum, Bankura, Purulia and Hooghly. The University of Burdwan was established on 15<sup>th</sup> June, 1960 with six departments. Numerous job-oriented courses like Tourism, Management, Mass Communication, Geospatial Science, Engineering education etc, have come up since 2000 onwards. Now there is a wide variety of courses (66) and 33 academic departments in this university (<http://buruniv.ac.in>).

The university gives accommodation to teachers, staffs, students and research scholars in quarters and hostels. In last fifteen years Post Graduate student strength of the university has been increased by 53% from 2000-01 (2652) to 2015-16 (4057), but the number of hostel boarders has been decreased from 62% (1650) of total students in 2000-01 to 40% (1600) in 2015-16 (Annual Report 20015-16, B.U.). This is because increasing number of students now can commute Bardhaman from surrounding areas of the town due to improvement in road and rail transport networks. The bulk of students come from Bardhaman, Hooghly,

Bankura and Birbhum districts. Majority of hostellers come from Birbhum (23.6%) and Bankura (22%) districts as these two districts have poorer communication with Bardhaman town than Bardhaman and Hooghly districts (Tables. 3, 4). However students also come here from northern hilly districts, plateau areas in the west and Sundarban area in the south. Further, distance education and correspondence education under the University of Burdwan are also helpful to many students to continue their higher education.

In this town there are as many as 13 colleges including degree colleges, polytechnic, dental, medical, homoeopathy colleges and also teachers' training colleges, art and music colleges within the municipality area. Along with many Bengali medium schools there are 8 private English medium High schools and a central school also. Prevalence of many computer training schools and coaching centres for competitive examinations make the town literally an educational hub from K.G. to P.G. which attracts students of Bardhaman district (East and West) and other surrounding districts.

Thus there is a dominant flow of semi-migrant students for general and job-centric education to this town. To accommodate them many private hostels and messes have been sprouted up mainly in the surrounding areas of the University and colleges in wards no. 26, 27, 28, 20, 15, 16 and 23. Almost all the houses near university area now keep provisions for 6-10 paying guests attached to their dwelling places. Educational facility thus attracts people of surrounding villages to settle in Bardhaman town.

Table. 3. Student Flow from Different Districts to the University of Burdwan (2017)

Districts	No. of Students from Different Disciplines						
	Maths	Physics	Geography	Bengali	History	Commerce	Total
Bankura	13	8	15	39	22	11	108
Bardhaman	18	15	13	30	26	28	130
Birbhum	12	8	7	36	21	8	92
Dakshin Dinajpur	4	0	1	0	2	0	7
Darjiling	0	0	0	0	0	2	2
East Midnapore	4	5	2	6	3	4	24
Howrah	6	3	0	8	2	3	22
Hooghly	17	14	13	28	37	16	125
Jalpaiguri	0	0	1	2	2	0	5
Kochbihar	0	1	1	0	0	0	2
Kolkata	3	4	0	4	2	4	17
Maldah	2	2	0	3	1	0	8
Murshidabad	8	6	2	12	7	4	39
Nadia	3	3	3	7	3	2	21
North 24 Parganas	2	2	2	5	4	0	15
Puruliya	4	4	2	8	11	2	31
South 24 Parganas	1	0	1	2	4	0	8
Uttar Dinajpur	0	0	1	3	1	0	5
West Midnapore	5	5	2	11	7	0	30
Total	102	80	66	204	155	84	691

Source: Field Survey, 2017

Table. 4. Hostel Boarders from Different Districts to the University of Burdwan (2017)

Hostel Boarders From Different Districts	No. of Hostel Boarders (BU)	% of Hostel Boarders
Bankura	71	23.66
Bardhaman	38	12.66
Birbhum	67	22.33
Dakshin Dinajpur	4	1.33
Darjiling	1	0.33
East Midnapore	7	2.33
Howrah	9	3.0
Hooghly	36	12.0
Jalpaiguri	4	1.33
Kochbihar	2	0.66
Kolkata	4	1.33
Maldah	3	1.0
Murshidabad	11	3.66
Nadia	5	1.66
North 24 Parganas	6	2.0
Puruliya	11	3.66
South 24 Parganas	7	2.33
Uttar Dinajpur	4	1.33
West Midnapore	10	3.33
Total	300	100

Source: Field Survey, 2017

#### 4.4.2 Medical Facilities

Besides educational facilities, Bardhaman town also enjoys good medical facilities. There are more than 200 medical stores, more than 300 dispensaries, more than 100 pathological centres, X-ray clinics and poly-

clinics, one hospital and many nursing homes (38) within the municipality boundary. Adjacent to the municipality boundary there are as many as 17 nursing homes and 2 multi-speciality hospitals (2017). About 60% nursing homes, the medical college



hospital and 80% of other medical facilities of the town are concentrated within 1km<sup>2</sup> area in wards 29, 30 and 32 (Table. 5). The Burdwan Medical College Hospital has around 1099 beds in total and around 100 beds in the Super Speciality wards like Cardiology, Neurology, Urology and it has 235 residential doctors also (www.burdwanmedicalcollege.org). Daily 15000 outdoor patients and 6000 indoor patients are also served by this hospital. So there is tremendous pressure of patients with a 1:5 bed-patient ratio in this hospital as entire East Barddhaman district and surrounding areas of Bankura and Birbhum districts depend on Burdwan Medical College Hospital to avail better medical facilities. About 40% nursing homes have 10-20

beds, 50% nursing homes have 20 to 30 beds, 10% nursing homes have > 30 beds (CMOH Office, Burdwan, 2017). In last 15 years critical medical facilities of dialysis, chemotherapy, radiation, MRI etc, have become available in Burdwan hospital and in four other nursing homes of Barddhaman town. It has also widened the service area of medical facility over 60-70 km radius from the town and overdependence on Kolkata has been curbed down. However concentration of various medical facilities at a single node, (Khosbagan area, ward 29 and 32) and easy accessibility of Barddhaman town through rail and road network with her surrounding districts have also made medical facilities available to many people.

Table. 5. Medical Facilities in Barddhaman Municipality

Locality	Hospital	Nursing Home	Medical store	Dispensary	Pathology centre	X-ray clinic	Poly-clinic
Wards (29, 30, 32)	1	24	150	220	47	22	26
Barddhaman Municipality	1	38	215	300	54	25	30
Adjacent to Municipality	2	17	20	20	8	5	0

Source : Report of CMOH Office, Burdwan, 2017 & Field survey 2017.

#### 4.4.3 Transport Facilities

Barddhaman town seems to be the nucleus of the East Barddhaman district as Barddhaman is the district head quarter and various socio-economic amenities and marketing facilities are concentrated here. For its more or less centralized location in the district, it takes hardly two hours to reach at any part of the district from this town by bus or train. Daily around 1000 bus trips connect the town with

east and West Barddhaman districts. Daily on an average 100 bus trips in each route connect Barddhaman with surrounding towns of the district like Kalna -Katwa in the east, Durgapur- Asansol in the west and also with the state capital Kolkata. The town has most frequent bus connection with South Damodar police stations of Raina and Khandaghosh and districts of Hooghly, Bankura, Purulia, East Medinipur and West

Medinipur. Nearly 500 bus trips a day enrich the transport system in this route.

Barddhaman is an important railway junction of Eastern Railway. All the long route express and mail trains of Eastern Railway connecting Eastern, Northern and North-Eastern parts of India, halt at Barddhaman station. As many as 150 local trains connect Barddhaman with Howrah and 24 local trains and ten pairs of express trains connect the town with Durgapur-Asansol area daily. Barddhaman is also connected with Birbhum district directly by local and express trains. Recently broad gauge rail line between Barddhaman and Katwa (under construction) has brought eastern part of the district closer to the town. As a result of such good connectivity daily 1 lakh passengers move up-and down through this station (Barddhaman Rail Enquiry Office, 2017) to avail educational, medical, administrative and marketing or commercial facilities of the town.

Besides external transport development, improvement of approaching roads and internal road condition of the town has also taken place in last fifteen years through replacing unmetalled roads or lanes into metalled or concrete ones. Construction of flyover to arrest traffic congestion and widening of main transport line G.T. Road is on process. Internal transport system of the town has become easier with the introduction of toto- rickshaw. In last three years number of toto- rickshaws has been increased from only 400 (2014) to 6000 (2017). It has minimised both the time distance and cost distance of places away from main road. The field survey shows that there is a very high frequency of plying bus, two-wheelers, four wheelers and bi-cycles at the main transport

junction of the town, Birhata from morning to evening. Even on Sunday on an average 100 buses, 500 two-wheelers, 450 bi-cycles and 200 four-wheelers cross Birhata crossing point every hour during 8am to 11am. Number of two-wheelers and bi-cycles further increases during week days. Main Internal road, B.C. Road always remains jam packed with bi-cycles, tri-cycles, motor-cycles and cars at every important junction point. Though increasing number of vehicles has further aggravated the internal traffic congestion problem and time distance from one place to another increases twice to thrice since 9a.m. However a good rail and road network has favoured the prospect of the town as a market centre.

#### ***4.4.4 Marketing Facilities***

Barddhaman town acts as central place in East Barddhaman as it is the only class-I town of the district and the district headquarter as well. As the betterment of transport facility has shortened the time distance between Barddhaman and Kolkata, it has helped Barddhaman to flourish as a market centre for consumer goods. The largest market complex is located along the B.C. Road near Curzon Gate (wards 31, 34). There are about 300 shops of garments and various consumer items within this market complex. Many other small and medium market places, shopping mall, branded companies for jewellery, garments and shoes and electronic gadgets have flooded the market sector of this town. Marwari business personnels are entering this market world and new market complexes are coming up along the main transport artery, G. T. Road indicating a trend of urban sprawl.

Thus the assemblage of educational, medical and administrative facilities, expanding consumer market and good transport network gears up the economy of Barddhaman town and reduces people's overdependence on Kolkata city as well. Flourishing urban market and social amenities are attracting people from various socio-economic backgrounds from absentee landlords, informal labourers to servicemen and non- Bengali businessmen to this town.

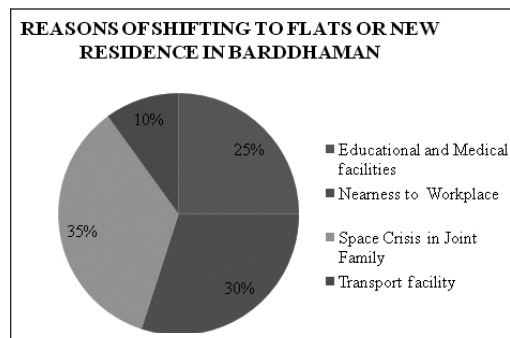
#### 4.5 Vertical Expansion of Barddhaman Municipality

Migrants and semi-migrants from various parts of the society along with her native inhabitants are slowly turning Barddhaman into a melting pot of various cultures. To accommodate these immigrants vertical expansion of the town has been taking place since 2000. In 2000 there were hardly ten multi-storied residential apartments and now it has turned to 203 over 15 years with a density of 8 multi-storied building per km<sup>2</sup> area. About 90% of these buildings are however 6-flat, 9-flat or 12-flat apartments and the rest are 18-flat, 24-flat or 54-flat apartments. Such small and medium size apartments are common in this town due to haphazard growth and dominance of narrow and winding roads in this town.

Almost all the wards of the town have one or two multi-storied residential apartments and they are largely concentrated in wards no. 11, 12, 14, 15 and 16 to the south-eastern part and also in ward no. 9 to the east- central part of the town due to availability of open space and a low to moderate population density there. Presence of open space and relatively low land price away from the market centre

of the town favours the location of multi-storied buildings in this town. Maximum concentration of residential apartments (40) occurs in ward no. 12 (August, 2017) followed by ward no. 14, 15, 9, 16, 11 and 27 (10-17 apartments).

The field survey shows that multi-storied buildings are not only occupied by the immigrants, but also by the original town dwellers in many cases. About 35% households of the surveyed residential apartments have their original home in the town and they have shifted to flat for space crisis and lack of adjustment in joint family. About 30% households have shifted because Barddhaman is the nearest urban centre from their rural working places and the town has easy access to their original home town as well. About 25% households have shifted from nearby villages to provide better educational and medical facilities to their kids. About 10% households have been attracted by transport facility which makes Kolkata and their original home easily accessible from Barddhaman and also due to social security received from their relatives who have already settled in this low cost and less polluted town (Fig. 4).



Source : Field Survey, 2017

Fig. 4. Reasons of Shifting to Flats or New Residences at Barddhaman

#### ***4.6 Urban Hazards and Prospects in Bardhaman***

Along with rising commercial space and growing flat culture, slum is an obvious product of urbanization here. There are as many as 141 slums with 91000 population in the town. Slum dwellers are mainly Bangladeshi refugees, poor Biharis, Santal tribe or poor muslim families. Though congested houses, poor building materials and poor sanitation are common slum characteristics here, slum dwellers get adequate groundwater supply as the town is located on a rich aquifer zone with shallow water table (Laha, 2016). This is the prospect of the town to thrive more population in future.

Another problem is traffic congestion resulting from very high population density of the town and a daily floating population of more than 1.5 lakh people to the town. Burgeoning number of toto rickshaw to reach transport service at every corner of the town however deteriorates free movement through unbearable traffic congestion specially near schools, colleges, hospitals and market complexes and consequently the time distance from one place to another increases three times during peak hours of the day. However to solve this problem of traffic congestion a flyover construction connecting both sides of Bardhaman Rail Station has been started since 2008 and it is supposed to be completed in 2018.

In spite of the inevitable urban hazards Bardhaman has a historical importance. Historical places like Curzon Gate, Nawab Bari, Tomb of Sher Afgan, palace of Rajas, and religious centres like Sarvamangala temple, Kamalakanta temple, Kankaleswari temple, Bardhamaneswar and adjacent

to the town 108 Shiva temple, presence of a planetarium, science museum and year-round fairs and festivals are sufficient enough to explore the tourism prospect of this town. In addition, potential tourist centres of natural *sal* forest at Orgram (Bhatar) and Bhalki (Ausgram-II), natural lake beauty and migratory birds at Chupi char (Purbasthali-II), sculptural beauty of temples and mosques at Kalna town, etc, can make a package tour centring this town if planned properly.

#### **5. Findings**

1. Bardhaman became municipality town in 1865 and class-I town in 1961 and today the town has only 3.14 lakh population with same urban status in 2011. This is due to minimal areal expansion of the town from 12.8 km<sup>2</sup> to 26.3 km<sup>2</sup>.
2. Being enriched with a university and many schools, colleges and job oriented coaching centres, Bardhaman is really an educational hub.
3. Modern medical treatment from Medical College Hospital, 55 nursing homes, high density of dispensaries and many polyclinics in the town provide good medical facilities. Both the educational and medical facilities have wide service area within and outside the district.
4. Excellent road and rail networks have brought the town nearer both to urban-industrial centres and surrounding rural areas as well.
5. Transport facility has helped to the expansion of consumer market and growth of an urban mentality in this old agricultural town.

6. Educational, medical, transport and marketing facilities invite immigrants from surrounding areas to this town and it leads to fast vertical expansion through multi-storied residential buildings in the town.
7. Development of slums and growing traffic congestion are the main urban hazards of this town.

## 6. Conclusion

Bardhaman is an old town emerged during British period as an agricultural market town. Later, importance of Bardhaman town increases manifold to the surrounding rural people with the development of university and colleges and medical facilities of nursing homes and medical college hospital there. Betterment in transport network has improved the connectivity of Bardhaman with her surrounding rural and urban areas. It has strengthened immigration and has made vertical expansion an obvious consequence.

Presently much of the urban development is taking place outside the municipality boundary due to rising demand for residential land. Bus termini, large residential complexes, mini town, nursing homes and many English medium schools have been growing up adjacent to the municipality boundary. If Bardhaman becomes enriched with other urban socio-cultural amenities and administrative facilities, dependence on metro city will be reduced. Process of land use change has already been started in fringe area. Bardhaman Development Authority has

however delineated Bardhaman Planning Area, which includes the municipality and its adjoining villages located in seven Gram panchayats and covers an area of 157.62 Km<sup>2</sup> (<http://bdaburdwan.org>). This urbanization process will be further geared up with an exploration of tourism potentiality. Bardhaman will literally emerge as a model town with a sound socio-economic base though there is no heavy industry in the town. So it is the right time that Bardhaman should get the status of municipal corporation from mere municipality for a healthy rural-urban development.

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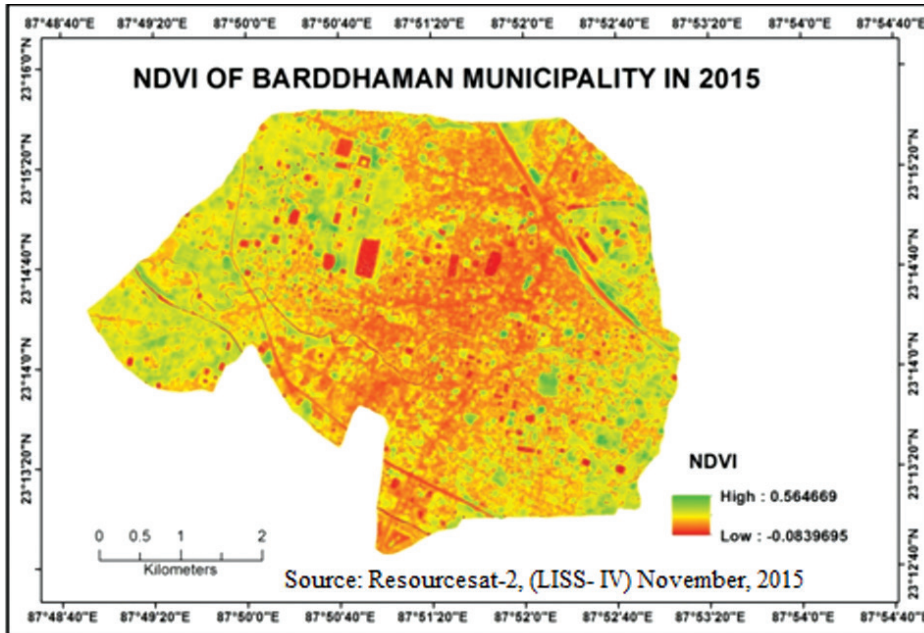


Fig. 1. NDVI of Bardhaman Municipality in 2015 (see page 37)

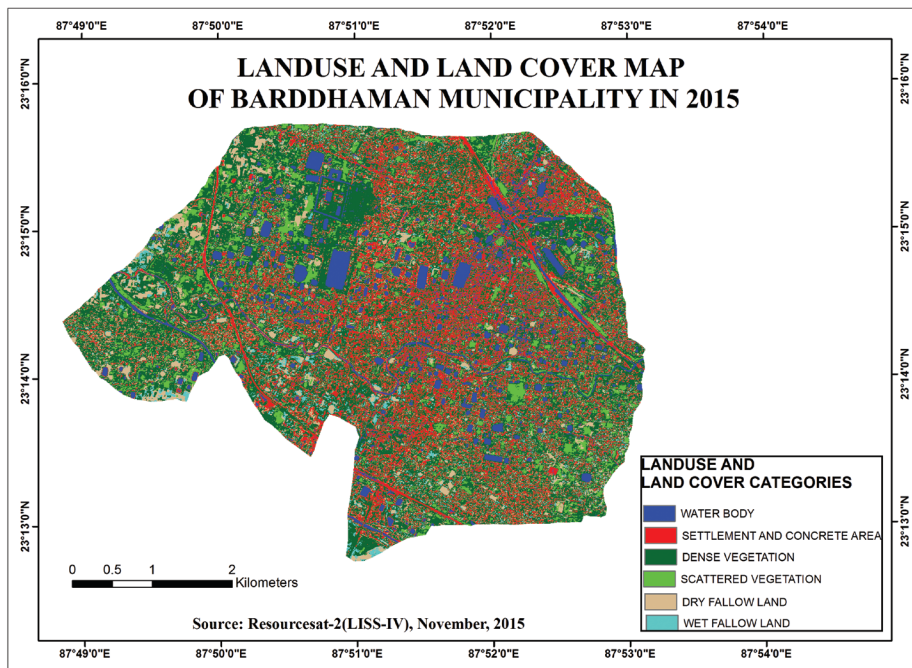
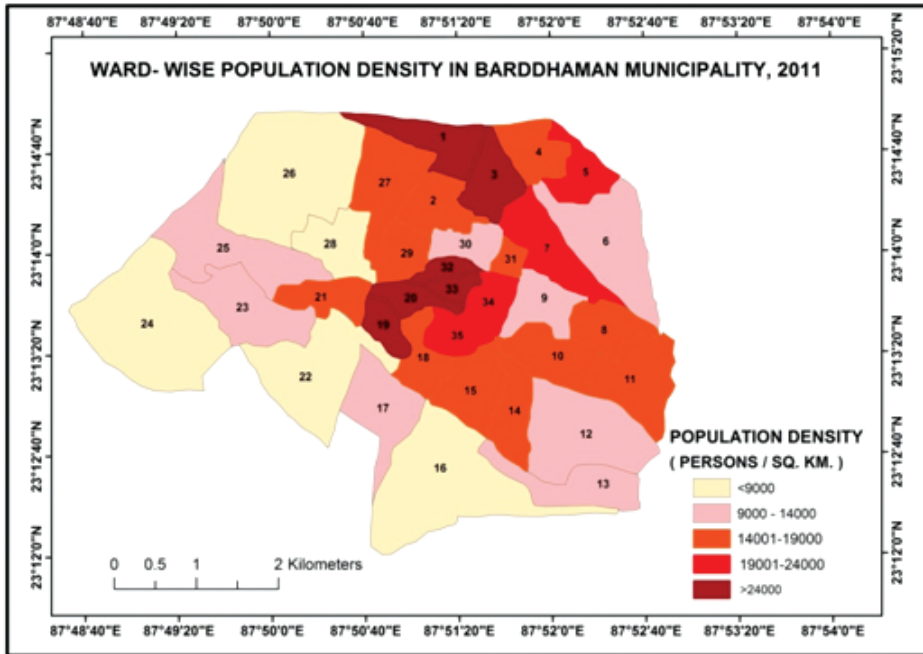


Fig. 2. Landuse and Land Cover Map of Bardhaman Municipality, 2015 (see page 37)



Source: District Census Handbook, Bardhaman, Census of India, 2011

Fig. 3. Ward- Wise Population Density in Barddhaman Municipality, 2011 (see page 37)

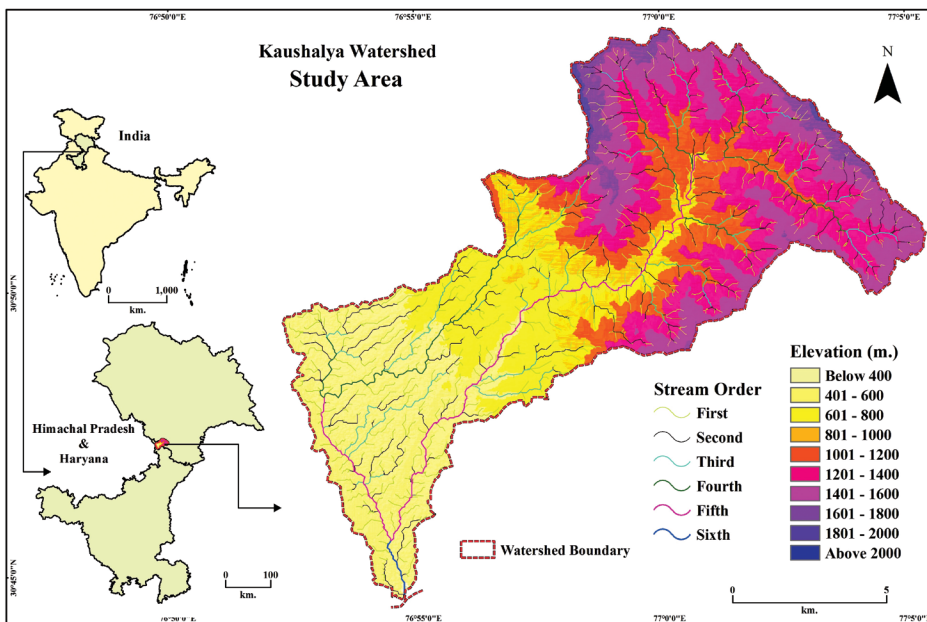


Fig. 1 : Location map of the Kaushalya watershed (See page 53)



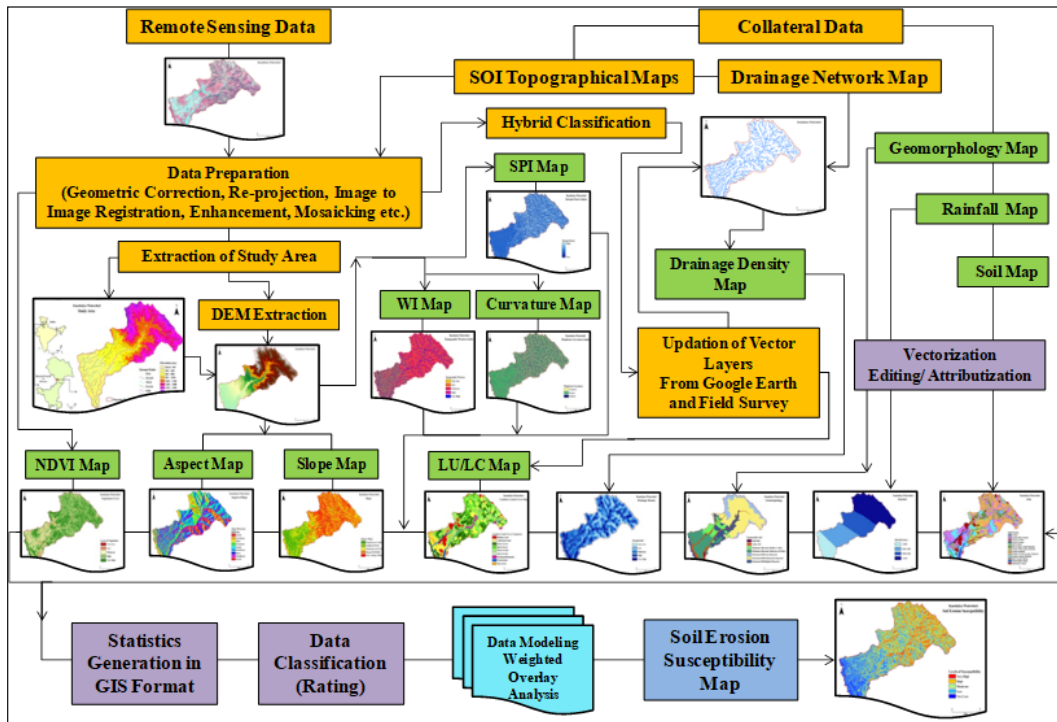


Fig. 2 : Data and methodological producers adopted for the study (see page 55)

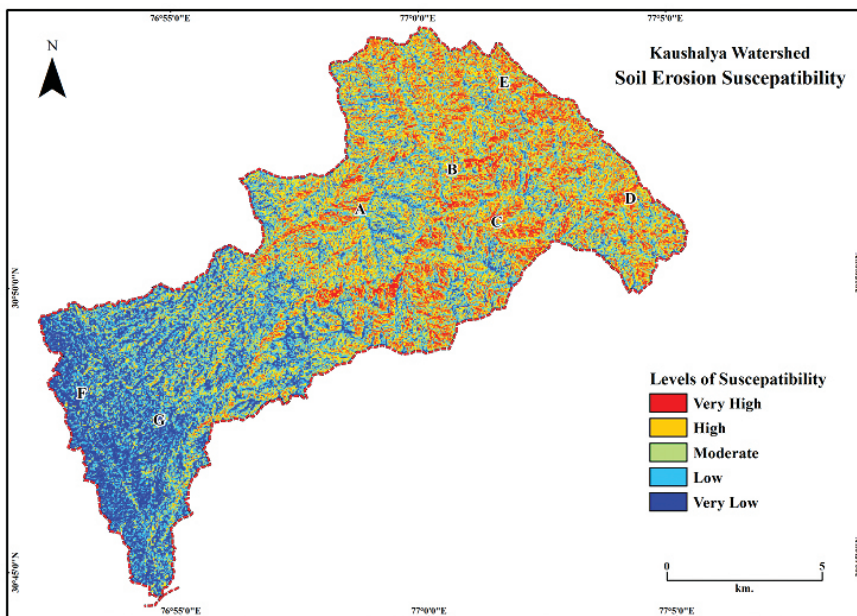


Fig. 3 : Status of soil erosion susceptibility in the watershed (see page 62)



Plate A: View of severely eroded weak horizons (see page 59)



Plate B: Stream bank erosion by Kaushalya River (see page 59)